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ABSTRACT

The work described in this paper dealt with two tasks: (1) to determine an individual's particular representation of a melody--how he represents it to himself, what relations he finds, and (2) to observe how an individual's representation of a melody might change in the course of working with given melodic materials in an experimental situation. Students were provided a musical gadgetry in which a typewriter was coupled with a computer and a "music box." The box could produce a five octave range of pitches and could play up to four parts simultaneously. Subjects were to build a tune which made sense to them. From this, strategies which they invoked and decisions they made were studied. Narrative accounts of two students' efforts appear in the report. (Author/CP)

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WHAT'S IN A TUNE

by

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WHAT'S IN A TUNE

The work reported here began with two fundamental assumptions:

(1) The perception of music, like the perception of a visual scene or a line of text, is an active process; it involves the individual in selecting, sorting, grouping and inter-relating the features of the phenomena before him/her. In this sense perception of even a simple tune is an intelligent process which requires the individual to RECONSTRUCT its features and relations.

(2) Individual differences in response to a potentially sensible melody (e.g., it does/does not "make sense") rest heavily on just which features the individual has access to or is able to focus on. In addition flexibility of focus and the kinds of relations the individual can build among features strongly influences his response.

Our first task then was to try and capture the individuals' particular REPRESENTATION of a melody -- that is, how he represents it to himself, what features he "grabs", what relations he finds. Our second task was to observe how an individual's representation of a melody might change in the course of working with given melodic materials within a relatively controlled experimental environment.

We ask then: What are the crucial features captured by an individual's representation of a melody; will these be significantly different among individuals? As a correlary, do individuals differ in their internalized MODELS of a sensible tune? More specifically, we asked: What strategies will an individual invoke and on what bases will he/she make decisions in building a tune that makes sense to him. Finally, is there a describable relation between an individual's model of a tune, his mode of representation, strategies he invokes and a completed tune that he builds to his satisfaction?

In a search for answers to these questions we have observed the step by step progress of musically untrained college students as they built an original tune. The experiment was actually one small part in the development of a new learning environment where students of varying ages are actively and systematically exploring the bases of musical coherence.[1] Within this experimental learning environment students are encouraged to probe and questiontheir own responses, to search within the relations of pitch and time for what makes sense, for what generates a new effect or a new structural meaning.

The gadgetry with which the student works is quite simple: He finds himself before a typewriter which is coupled on one side with a computer and on the other side with a "music box" about the size and shape of a lunch box. The music box can produce a five octave range of pitches and can play up to four parts simultaneously. The box also plays two percussion sounds, one similar to a tom-tom and the other to a brushed cymbal. The student describes to the computer what he would like to hear by typing on his typewriter-terminal. The computer in turn causes the music box to produce the configurations indicated. The response is immediate. Thus in using the system the student need only be concerned with thinking out what he wants to happen. He can sit back and listen as often as he wishes to what he has invented, change it, and listen again to the result. The instant feedback of his ideas in sound and time tells him immediately the relation between his thinking, his description and the resulting musical <u>effect</u>. He is learning how to influence and control musical relationships through designing a particular kind of musical process.

If he can think it and describe it adequately, he can make it happen, and if he is surprised by what his description brings forth, that is often the moment of most productive learning.

To capture the experience of a student in this particular project, put yourself in his place. Seated before the terminal you type, simply, G1. Instantly the electronic music box performs for you a brief, 3-note motif. We call these motifs "tune blocks." Think of them as building blocks of various shapes but the "shape" depends, here, on the particular configuration of pitch and time which the prepared computer procedures describe. In this example of the game you have five such tune blocks: the game is to arrange these five blocks so that they make a whole tune

[Example 1]

that you like, that makes sense to you. While the blocks actually make up an existing tune, notice that you are not trying to get a "right answer" but rather to invent your own reasonable tune within the limitations of these five blocks. You can, of course, play the blocks as often as you like -- individually or in any arrangement. If you want to hear two or more blocks in succession, you simply type out their names in the order you want. The duration of the pitches remains exactly the same when blocks follow one another; that is, the computer processes the whole chain of blocks (e.g., G1 G3 G2) and then plays the whole chain "in time" when you indicate

[Example 2]

you are ready. In designing your tune, you are free to repeat blocks whenever you think it appropriate.

While the game seems obvious enough we were astounded to discover the varieties of strategies and levels of engagement with which each student became involved. There seemed to be as many procedures for playing the game as there were players. Indeed, of eight students involved in this experiment, each invented a different tune with this same set of blocks and each tune had its individual effect or character. Interestingly, each student's "solution" was met with astonishment, even distaste by the other students. Indeed, in order to understand each student's tune, the others had to "restructure" their thinking, adjust their perception of the shared material. While this gives some inkling into the importance of context (only the arrangement of the blocks varied among the tunes), the students' own discovery of the significance of context was of greatest importance. Students found that the "meaning" of a block changed as its position in the set changed. That is, as they played with various arrangements, embedding the blocks in different contexts, they gradually became aware of new and different features of the individual blocks. The notion of what constituted a significant feature or a significant structural "element" (e.g., a note, a particular pitch-time figure, a rhythm, a whole block) became one of paramount importance, influencing the eventual "form" and affect of the completed tune.

Our observations of the students have given us a glimmer of what learning might mean within this environment. At the same time, we, as observers, have been catapulted into a re-examination of our own assumptions; our own models of structure, modes of description, categories of analysis and theoretic "givens" have been boldly exposed for re-examination.

Most of the examples discussed here are taken from the work of but two students, but it should be emphasized that this project was only a beginning for them and for us. The musical materials with which the students worked are limited; the blocks have built-in stylistic constraints which, in turn, suggest a limited set of possibilities for achieving structural coherence. But these very limitations permitted our students and us to explore the nature of these particular possibilities and they proved to be much richer than we had imagined. Further, the relative familiarity of the stylistic constraints permitted students to confront more easily those generative primitives from which larger and more complex musical structure derives. In subsequent projects involving the particular "contents" of tune blocks these primitives were more explicitly explored.[2] In addition, students listened to significant works in a variety of musical styles where they discovered (sometimes dramatically) that these same generative primitives contributed to a musical coherence which had previously been inaccessible to them. Their affective response and "taste" was often quite transformed as their "perception" became both more acute and more mobile.

Note: A written description of our students' work presents certain difficulties for the reader. The reader's experience in looking at the musical examples can only partially capture the experience of those who play this game entirely "by ear." Representing the tune blocks in standard music notation introduces information to the reader which is biased by the assumptions inherent in the representation itself -- and possibly quite different information from the non-reading listener. Our own observations just with the tune blocks game and with a small number of individuals suggest significant differences between those who read music and those who do not. Perhaps the most crucial asset for the non-reading listener is his ability to deal directly with the motive as the basic "element" of a tune, as in contrast with the reader for whom the note tends to be the basic element. Thus, the question becomes: on what level does one enter the world of a given melody and with what sorts of built-in assumptions?

THE STORY OF THE TWO TUNES AND HOW THEY GREW

Our two students, Mark and Jorge, make a striking contrast. Mark "studied the violin a little in high school" but claimed to have forgotten all that he had learned. Jorge was from Peru, played the guitar a little "by ear" and enjoyed singing Peruvian folk songs of which he knew a great many. Mark worked carefully, methodically and often paused in his work to "think". Jorge worked impulsively, quickly, and seemed to enjoy every bit of melody, every possibility that he caused the music box to play. Mark talked little, his comments were cryptic. He made only 19 requests of the music box to complete his tune. Jorge talked a lot and expansively. He made a total of 82 requests to the music box to complete his tune. [3.]

Their strategies were also markedly different. Mark searched quickly for a beginning and ending for his tune and then systematically found material to fill the gap between. While he focused right away on particular features of blocks--especially similarities and differences among them--his "perception" of features, his selection of priorities, changed dramatically in the course of his work. Jorge tried many many combinations of blocks and often responded with some comment concerning their effect or their character. Only later did he become concerned with particular features which generated these effects and still later with how his combinations of blocks might work together to form a whole tune. The shift in Jorge's reconstruction, in his "perception" of the blocks and their features, came suddenly and carried with it an equally sudden insight for the structure of his completed tune.

Beginnings: MARK

Mark begins in his typically orderly way--he plays each block in order and notes what are, for him, cogent features:

[Example 3]

Mark has been told that the blocks are jumbled--that is, their numbering is arbitrary and has no particular significance to an arrangement that might eventually become a tune that "makes sense" to him. So, considering each block as an individual entity is initially inevitable; and yet whatever Mark hears first will also inevitably influence whatever follows it. Thus, G2 is "faster" compared with G1. His comment notes a relatively local difference between G1 and G2: G2 includes more notes per unit of time. The comment is local because Mark is pointing to a single, particular feature, one that he spontaneously selects as differentiating G1 and G2.

In contrast, "could be a closing" is a higher level comment: It implies relationships among several local features. In addition it is more global because it suggests that this aggregate of features generates a function which may be significant to the overall structure of the completed tune.

What aggregate of features generates the function, "closing"?

1. G3 ends with a low pitch of longer duration. Both features create a point of structural articulation--an accent.

2. The motion to this final pitch is stepwise downward; the melodic motion is clearly directed towards this accented note.
3. G3 ends with the pitch that sounds most stable or at rest in relation to the other pitches: the pitch usually named, tonic.

But this last feature is, itself, the result of an aggregate of features, features not only of G3 but also of G1 and G2 which are, after all, already part of Mark's working context. For example:

(a) The sense of stability results from specific limitations of the pitch collection thus far (i.e., all those pitches included in blocks G1-G3);

(b) The order in which these pitches have occurred -- particularly in G3;

(c) The features of G3 described in 1. and 2. above.

Note that it is not any one of these features but the relation among them which generates the higher level feature, stable pitch or tonic.

Listening to G5, Mark now makes a comparison between it and G1 -- this time noting "similarity" rather than difference: Mark's single word, similar, suggests his access to the "rhythm" (set of durations) of G1 and G5, which is identical and their "pitch-shape" which is also essentially the same. But it is important to observe that Mark has remembered G1 well enough so that he can compare it with G5, even though he has listened to three other blocks in between. Evidently, Mark's access to these similar features and his means of representing them to himself are sufficient to allow him to "hold"

the configuration in his memory for future recall and comparison.

Indeed, all of Mark's comments serve him as mnemonic labels -- a means for representing the blocks to himself so he can get at them and manipulate them in his head. With the exception of his very first comment -- (. . . what can I do with that???. . .) all his other "labels" make use of local features or aggregates of features as identifiers. In turn the labels Mark has chosen and the selective priorities they imply influence and guide his use of the blocks as he continues on in the development of his tune.

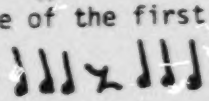
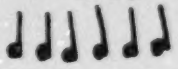
Beginnings: JORGE

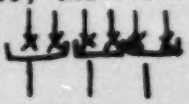
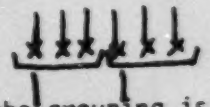
Jorge begins quite differently. He plays the whole set of blocks as a single string--as if to ask what kind of a melody that would make. Then he quickly plays individual blocks beginning with G1, twice, but then jumping around in the numeric order. (see appendix)
His comment at the end of these 11 requests is, "G2 and G4 are the main parts--but how to use them? I don't know what comes after G2. G5 may be an ending." Notice that none of Jorge's comments refer to specific features of the blocks. Like characters or events in a story, he ponders what might come next, which blocks are the "main" ones, which block might end the story. Jorge's initial notion that G2 and G4 are the "main parts" influences his work almost to the end. The problamatic G2 will continue to trouble him for a long time, and that "G5 may be an ending" undergoes a surprising switch.

Working out Possibilities: MARK

Taking off from his first observations, Mark tries pairs of blocks, testing his hunches. Playing his "similar" blocks, G1G5, he creates a new entity and gathers new information:

[Example 4]

Juxtaposition of the 3-note motives G1 and G5 defines (or perhaps confirms) the higher level rhythmic grouping. Notice that it is only by playing the blocks in pairs that Mark can determine the duration of the last note of the first block in this pair. For example, G1G5 may have been  rather than  . Juxtaposition determines that the new entity is an uninterrupted set of equal durations. In turn, juxtaposition reveals that the unit pulse generated by the uninterrupted set of equal durations is grouped into threes by the pitch-shape which is shared by both blocks.

Thus, it is the pitch relations that generate the higher level rhythmic grouping. To explicate this point, consider the following example: if I ask the music box drum to play six hits all of equal duration and loudness, the listener can arbitrarily group these hits into twos or threes:  or  UNIT PULSE GRouper PULSE

But once pitch is added as in G1G5, the grouping is no longer arbitrary; the grouping is defined as two pairs of three notes each, at least until some additional information is introduced to conflict with this grouping. Thus, the pitch-shapes in G1G5 generate a slower pulse with a ratio of 1:3 to the unit pulse. (This ratio of "grouper" pulse to unit pulse is called meter. G1G5 generates triple meter; a ratio of 1:2 is called duple meter.)

Moving ahead, now, Mark's 9th request (G4G2) shifts his focus and leads him into new realms of enquiry:

[Example 5]

......"sounds like an opening, but there's a change in time."

(pause)

"How long is this tune?"

(pause)

"I don't know how to match."

Mark's more global comment concerning the opening <u>function</u> of this new entity is qualified by "..but there's a change in time". What does he mean? Initially it was assumed that Mark was simply referring to the increase in number of notes per unit beat--"change" meant faster. Later, as a result of another student's comments, we realized that Mark was responding to an implied shift in <u>metric grouping.</u> The last note of G2, with its relatively longer duration, contained or delimited the faster motion leading into it; thus this last note seemed to function as an accent or downbeat. The result was the suggestion of a duple grouping in contrast to the clear triple grouping in G4.[4].

[Example 6]

With this glimpse of a problematic beginning, Mark pauses, looks visibly uncertain and then seems thrust into a search for the whole: "How long IS this tune?" But, this leap towards global structure is too fast for his present state of information, i.e., what he "knows" of the features of the blocks and the relations among them. He retreats to a more limited field: "I don't know how to match." What can Mark mean?

Part of the explanation lies in Mark's work earlier in this same session. He had been playing a different version of tune blocks where he was asked to listen to a complete tune and then simply re-build it. In this first game Mark obviously did know how long the finished tune was going to be; he had only to "match" blocks, one-for-one, with the original till his arrangement fit. While it is clear to Mark that he can now build his own tune, he is evidently uncomfortable in this new situation; design, including proportions, depends only on his decisions. What can he base his decisions on?

Mark's comments suggest his search for a strategy. Without the defined constraints of an actual tune, Mark is left with "matching" the features of the tune blocks with the ill-defined features of his "model" of a sensible tune. He has found a beginning that tentatively "works"; on what basis can he make decisions for continuation? For example, how can he build a destination, a goal for his beginning; how can he form groups of blocks to make larger structural elements, how can he form parts of a whole if the whole does not yet exist? Mark is grappling with crucial questions involving the interaction between local and global structure, between detail and larger design: each level of the structure defines, even generates the other.

With his next request (G1G3G5) Mark escapes from his momentary discomfort:

[Example 7]

"Ah, cool. . . I could end the song with G3, a long note, but G5 would be a surprise ending. I have lots of endings."

Mark still doesn't know how long the tune is going to be, but at least he knows where it's going. Like a lost traveller, he has an idea what his destination is, that should make it easier to find his way there.

What are the features of Mark's ending combination?

Interestingly, Mark's first pair, G1G5, is included in his closing combination but this pair is broken apart by the interpolation of G3. As a result of this new embedding the sequential relation between G1 and G5 is obscured. Indeed, both G1 and G5 take on a new meaning: G3 takes over the role of G5 as resolution or completion to G1; G5 takes on a new role -- "surprise ending".

Why is G5 a "surprise ending?"

1) G1G3 is self-contained, it ends conclusively on the tonic and on a strong beat in the triple meter. But G5 continues on after the halt of G3; the action spills over.

2) After the rhythmically accented, longer duration of G3's tonic final note, the tonic but weak beat ending of G5 generates a whimsical close.

3) G5 echoes G1 in pitch shape and rhythm but has a different function -- G1 is a "lead-in", but G5 another ending. (It's a little like a pun.)

Mark has constructed the outline of a completed tune; his tune is de-limited, his problem space defined. Now he has only to work out some means for getting from one end to the other. As often happens with real composers, the middle of a composition is frequently discovered last.

Working out Possibilities: JORGE

Jorge's style for working out possibilities is again strikingly different from Mark's. Jorge quickly makes 21 requests of the music box, trying various pairs of blocks and occasionally a longer string.

[Example 8]

The problem, "what comes after G2," is clearly worrying him; eight of his requests involve pairs of blocks that begin with G2 followed by one of the other blocks. His explorations lead to two discoveries that have significance for the future:

1) G4G3 is "good, and maybe at the end after G2." Indeed this pair does end Jorge's completed tune, but it undergoes much manipulation before settling down.

   [Example 9]

2) Juxtaposing the blocks with the most variety, the greatest density of events (G2G4) he responds: "It's a wild one, huh?"

   [Example 9A]

Jorge enjoys the expressive potential of even this limited musical material. Later on when he sang some Peruvian folk songs, it was clear that for him the primary purpose of the music was to reinforce the quality of the words -- you couldn't really "get" the song without understanding the words.

Evidently tired of worrying about G2 and looking for a way to get on, Jorge hits upon a useful strategy: immediate repetition of a block as a means for expanding the restrictions of the material. Jorge describes his strategy quite clearly: "I repeated blocks to make bigger things to work with -- the blocks were too small alone. It was a way of stopping

to use a new block each time. By repetition I relieved that restriction, I had more blocks to work with." Typical examples of the procedure are:

[Example 10]

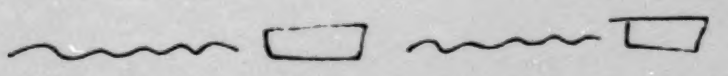
Out of his experiments with repetitionof blocks, another structural principle seems to emerge: a tune can be built up of cells or modules. The pairs of repeated blocks form the beginnings of these cells which Jorge then expands into larger modules. These modules can then be pushed around and modified to form a sketch, a tune-in-progress. Once more Jorge describes his strategy: "I was thinking in small blocks that were growing. Then I built a whole song; didn't like it. But after that I began thinking of a whole song that I could change to make it better."

Typical of this process are the following examples which are built up from the smaller cells in Example 10.

[Example 11]

Notice that the large modules which make up the two halves of each tune are kept intact. In Request 51 Jorge simply flips the two halves of Request 50, keeping each module intact, but placing them in reverse order. In the process Jorge's ending combination (G4G3) comes up in the middle!

Listening to the result propels Jorge into new considerations. He focuses directly on the potential function of G3 and for the first time focuses on a feature which generates that function: the "silence" at the end of G3 makes it a "link" and an "end." Jorge's representation of G3 is changing. He draws a picture of the tune:



Only G3 is a defined entity -- the pillars in an otherwise amorphous whole. Questioned about the "silence" at the end of G3, Jorge tries G3G1 and discovers the inaccuracy in his representation. "No, a long note so it must be an end." Contact with a level of greater detail leads Jorge still further along this path; he draws a pitch by pitch picture of his "main" blocks, G2 and G4:

In the process Jorge's representation of G2 and G4 is transformed: it includes more and different features. He comments: "Before I couldn't remember them so well, now I can spend less time playing them." Starting from a tune-in-progress Jorge has worked down from his larger vista into its details. Like a camera zooming in, refocusing the lense, features of blurred shapes become clearer. Now, with access to sharp features, Jorge grabs them and fixes them in his drawing -- to remember.

Jorge has made 53 requests of the music box up to this point. His delight with the possibilities, the potential character of these possibilities, and with his evolving modeuls has led him only now to consider particular features of individual blocks. Jorge said, on looking back at his work: "Drawing the blocks was important. You start out asking the computer to TELL you, later you can memorize them and do it in your head." To remember, then, means <u>to capture particular features, even to name the blocks through these features</u>.

Jorge finds himself facing a problem now: how should he proceed with this new and different information; how can he relate the kind of detailed features he has just discovered to his larger vista with its

blurred but character-rich shapes? He is caught between two views of this small world. A question from the observer guides him back to his previous world: "What do you know so far?" He says, "G2 and G4 are complex, important. G3 is an ending, it goes perfectly after G4." The observer asks, "Does it (G3) go after G2?" Playing G2G3, Jorge bursts into a description of the problematic G2:

[Example 12]

"I didn't like it (G2G3). The problem with G2 is it ends too fast; it goes up and should have something else before going down. The last note of G2 is too quick, it ends right on the border of the next one, so the next one needs more time in beginning. Maybe G1 (goes) after G2." Stepping back again he tries G1 after G2, inserting the pair into his previous tune-in-progress:

[Example 13]

Jorge's analysis of the problematic G2 is quite remarkable! It points to very specific features of the music, but in language which reflects Jorge's sense of qualitative character. He seems to have bridged the gap between asking the computer to "tell" him and the ability to grab the relevant features for himself. Consider what he says more closely:

1) G2 "ends too fast." Jorge is pointing to the same feature that Mark described as a "change in time." That is, the accent generated by the longer duration of the last note of G2 (relative to the preceding notes) implies a shift in metric grouping -- the accent arrives too soon, before the expected downbeat.

2) "It goes up and should have something else before going down." The instability of this last note -- both rhytmically and in pitch -- demands resolution, but first it should be extended -- perhaps to fill out a second group (or bar) of 2 beats:

3) "The last note is too quick, it ends right on the border of the next one. . . " Considering G2G3, G3 resolves the instability of the last pitch of G2 by returning to the tonic and to a downbeat but it does so too directly. The rapid movement through G2 needs to be slowed down, prolonged before descending to resolution.

4) G2G1 is "better" because resolution is not achieved -- the downward motion stops before reaching the tonic or a downbeat. However, there is still "no space" between G2 and G1. This evidently refers to the metric problem, again; a rest following G2 would satisfy Jorge's need for "more time in beginning."

[Example 14]

Jorge has a clear image of what he wants; the problems are defined but how to resolve them?

You will recall that Mark generated local mnemonic labels from the very beginning: "the fast one," "could be a closing," "similar to G1." With access to local features he can, in fact, "do it in his head." With his 10th request he has delimited the boundaries of his whole tune.

At the same time, Mark's exploration of the material is more limited than Jorge's. He shows no interest in quality or character and his ability to "fix" features also narrows the possibilities he can foresee. It seems fair to describe Mark as solution-oriented, or product-oriented -- he "played" with the material only just enough to get an answer. For Jorge, "playing" seems more important than any answer. The differences in approach have interesting consequences to what each student learns as well as to their final tunes.

ENDINGS

His tune delimited by a beginning and an ending, we left Mark as he glimpses the whole. Trying his beginning combination again (G4G2), he now finds it "O.K.". Why? While he had focused previously on relatively local differences between G2 and G4 ("there's a change in time"), Mark's shift in focus to the whole seems to shift his focus to features which both blocks share; Specifically, they share the same fundamental melodic skeleton: G4 and G2 are together a melodic embellishment or prolongation of the single pitch, G. G4 begins

[Example 15]

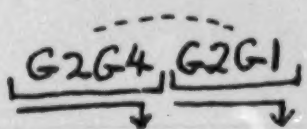
on the pitch, G, moves below it and returns. The middle G is again extended by the short, upper neighboring tone and the return to G on a weak beat. Compare the motion around G to that of a rubber band held still in the middle and stretched out on either side. Following G4, G2 becomes a further extension of this fulcrum pitch. Starting with the lower embellishing pitch, E, G2 moves to the fulcrum pitch. The final G generates an accent, but one that seems to arrive (as Jorge said) too soon - out of phase. But embedded in the whole, G2G4 can "work" as a lively prolongation of the single skeleton pitch G. Thus, G2 becomes a truncated and rhythmically animated version of G4. The relatively low level rhythmic conflict, shift in metric grouping,

becomes a momentary ambiguity subsumed within higher level relations; a detail in the larger structure assumes its appropriate role within Mark's new picture of a developing whole.

Moving into the final phases of his work Mark works rapidly, now. His strategy is clear: Take the last block of a constructed entity (G4G2, the opening) and use it in a trial combination with another block (G2G1), keeping in mind the ending combination, that is, the destination of the whole tune. Through this process Mark arrives on his 13th request, at the following expansion and transformation of his initial opening pair:

[Example 17]

The original opening (G4G2) is still present but it no longer forms a structural group or "chunk". G4 is now a low level goal, the destination of the sub-group, G2G4. G2 has become a beginning; twice it starts things off - first leading to G4 and then again leading to G1. In this context, the motion to the accented G in G2 acts like a kind of kick-off.



Mark's 17th request joins this expanded opening with his ending combination. Satisfied that he has a possible tune, Mark writes a little computer procedure which defines his whole melody:

```
TO MARK
1. G2 G4 G2 G1 G1 G4 G1 G3 G5
END
```

Now when Mark types MARK, the electronic music box responds with his whole tune.

[Example 18]

Mark is working now with the melody as a whole. Not satisfied with the middle of the melody, the joint between his beginning and ending stuctures, Mark deletes the repetition of the G1 block:

```
TO MARK
1. G2  G4  G2  G1  G4  G1  G3  G5
                ↑
END
```

[Example 19]

Still not satisfied, he trys another procedure which again only differs at the same midpoint in the tune. This time he deletes G1 all together and replaces it with G3:

```
TO MARK2
1.  G2  G4  G2  G3  G4  G1  G3  G5
                ↑
END
```

[Example 20]

Mark searches for an alternative; he tries G2G5 and then G1:

[Example 21]

That's it! "G3 should end on the same note as G1" The following was played on the piano.

[Example 22]

That was what he wanted:

[Example 22A]

At this point in Mark's work he is able to say explicitly what he wants to hear - something that isn't there but that he can imagine and describe, now on the level of a single precise pitch. He has begun to compose!

What is the source of Mark's dissatisfaction with MARK? What structural features is he trying to "match", the features of his model of a sensible tune? The problem is made explicit when he invents his own tune block - it's a question of higher level structural rhythm. Mark is searching for a sub-group which will be equal in total duration to the opening sub-group, G2G4. His internal model of a sensible melody seems to demand higher level structural symmetry. G2G4 includes three down-beats or measures, G2G1G1 also includes three measures. This solves the "balance" problem but the second sub-group includes three small motives or three motivic attacks in comparison with only two in the first sub-group:

[Example 23]

MARK1 solves the problem of equalizing the number of motives in the two sub-groups, but spoils the symmetry of the measures -- the sub-group, G2G1 includes only two measures:

[Example 24]

Introducing G3 in MARK2 solves all the problems of symmetry but causes the first half of the tune to be "closed out". The first half ends the same as the second half minus the "surprise ending; indeed the first half becomes less of an 'opening' than the second. One is reminded of Mark's comment: "I have lots of endings..."

[Example 25]

Mark's composed block solves the problems completely. He finds the necessary local features to generate 1) a symmetrical higher level (metric and motivic) rhythmic structure, and 2) an open-ended first half which can thus function as a beginning or large structural up-beat to his closing structure. In addition, Mark's composed block is similar to G3 reinforcing the symmetry:

[Example 26]

Indeed, on the highest level of structural rhythm - the relation between the two halves of the melody - Mark has also created symmetry: Each half of the tune includes 6 measures. The surprise ending function to balance the first half in total duration. On the lower level of sub-groupings, the second half of the melody provides a nice variation in the rhythmic grouping: There are two groups of 3 measures in the first half while the second half groups into 2 + 3 + 1:

[Example 27]

ENDINGS - JORGE

We left Jorge with his explosion into description of specific features necessary for a solution to his insistent problem--what comes after G2. His solution defined, Jorge searches now for further constraints. Like Mark, he asks, "How long is this tune?" Jorge is given a kind of answer, "12 blocks in all". He replies, "Yes, I thought I was missing something in the middle." Actually, this is a very funny reply since Jorge's current tune-in-progress is entirely different from the original tune from which the blocks were taken. Thus, Jorge's "middle" is not the middle of the original tune at all! But like Mark, Jorge seems to assume that there is only one possible tune to build out of these blocks--one "right answer." He almost has it, if only he can extend his tune in the middle, fix it up, he will arrive at the original tune.

It is interesting that this question occurs at quite different moments in the course of each player's work. For Mark the question of length came at the moment when he had only a beginning; a beginning sent him in search of constraints on the whole. Jorge asks the same question only after a long period of exploration through which he has "grabbed" explicit features of some of the blocks and through them also come to a definition of the problem which must be solved. And by this point in his work Jorge is also working with a sketch of the tune-as-a-whole; only now does he look for constraints which will define its total length.

After trying a few more combinations which again maneuver his various cells, Jorge tries G4 following G2 (the very same pair that forms Mark's beginning combination). Anticipating the result, he says, "This will be a strange one." Asked why, he says,

EXAMPLE 28

"Because I never thought of mixing G2 and G4. I felt they were separate groups. I thought the complex ones would be surrounded by simple ones (like islands); but they sound not bad." This was the decisive turning point in Jorge's work. In manipulating his modules Jorge's initial assumptions about these "main" blocks had kept him from thinking of them as a possible pair. Earlier on (request 27) he had actually tried the pair once--that was his "wild one". Still, not quite convinced, Jorge tries G2G4 again. He then performs his usual manipulation-repetition and expansion: G2G2G4G3. Asked to look again at his description of the problematic G2, now in the light of his new discovery, Jorge notes: "Yes, G4 doesn't go down immediately and it's slower." Indeed, the features of G4 do meet his explicit definition of a possible subsequent to G2, but interestingly, Jorge's constraints are met on the level of more global features not on the level of local features of the blocks:

1. G4 is, indeed, "slower" than G2 but on the local (note to note) level not significantly slower than G1 or G3. However, G4 is longer in total duration than G1 and includes more notes than G3. In fact, the combined effect of these features

is to make G4 effectively "slower" than G2 and also slower than G3 or G1 when paired with G2.

2. On the local level (note to note, again) G4 does, in fact, "go down immediately." However, on the more global level G4 goes nowhere. Embedded in the context G2G2G4G3, G4 is simply a prolongation of the fulcrum pitch, G--it starts there, and ends there. (see p.22) Once more, on the more global level, the effect is one of "slower."

3. G4 does not take "more time in beginning" as compared with G1 or G3, but more globally the repetition and prolongation of G2's ending pitch throughout G4, functions to generate this very effect. Where does G4 begin? The "border" of G2 is obscured by the beginning G of G4--a continuation of the "border" pitch.

4. All these features together give G4 the "right" function in relation to G2: G4 does not resolve G2, it extends it.

Jorge has found an unexpected solution to his very first problem: "I don't know what comes after G2". Inherent in his solution is a genuine

restructuring: His initial description of surface quality is first transformed into a description of explicit features of G2 and G4. These features in turn form the basis for a description of constraints which define a possible solution to the problem. Once defined, Jorge "recognizes" the solution and simultaneously breaks out of his previously binding assumptions.

Jorge's new insight takes place on his 69th request. Requests 75 and 77 produce "sketches" of the completed tune-but noticably excluding G2 and G4. The question seems to be now, where to embed them.

EXAMPLE 29

Request 77 is a clear elaboration of Request 75. Using his procedure of repeating blocks to expand, Jorge creates, whole, the beginning of his tune. Annoyed at the constraints imposed by "12 blocks in all", he goes on anyhow. Request 79 finds him flipping the two halves of his previous sketch, again, and adding to these modules his expanded G2G4G3 ending module.

EXAMPLE 30

And finally, switching the beginning modules back again but maintaining the second part:

EXAMPLE 31

Not completely satisfied, Jorge tries the beginning of his tune once more and then, like Mark, begins to compose: "I would like to have a G6 in place of the second G3...." He sings what he wants G6 to be and the block is built for him by the observer.

EXAMPLE 32

With this new block Jorge is satisfied; he has a tune that he likes.

What are the significant structural features of Jorge's tune? The most distinctive characteristic is its cumulative drive to G4 as climax. The climax is achieved in three phases:

EXAMPLE 33

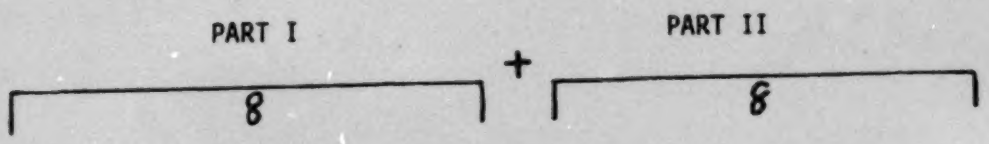
Phase I is a relatively stable opening statement; returning three times to the tonic, C. * Phase II is a sequential expansion of Phase I. Phase III starts again as in Phase I, moves forward quickly to the highest pitch and to a climax and abruptly ends. The sequential relation of Phases I and II (i.e., two modules, the second the same as the first in pitch-shape and durations, but shifted up one scale degree) generates a balanced and

* (Notice that Jorge begins his tune with the block that he had originally described as "may be an ending.")

clearly articulated onward and upward impetus. The forward impetus is, in fact, achieved only by Jorge's composed block, G6. The penultimate version, made from the <u>given</u> blocks, "failed" exactly because it dropped the onward thrust and also created a stop--it was closed out.

The second part of Jorge's tune begins like the first with G5G5 and carries the upward thrust of Part I to a climax (G2G2G4). The increase in activity which has been such a notable feature of G2 functions now to build to that climax. G4 establishes and prolongs the high point, achieving the anticipated climax followed by the closing block, G3 with which the tune abruptly ends. G2G4, the "wild one" of this small world, realizes its structural potential as climax. And the tune does include 12 blocks!

On the largest level, the tune is neatly symmetrical:



However, considering the <u>inner</u> grouping of these two parts together with the structural functions each generates, the effect is quite different:

EXAMPLE 34

Part I includes two balanced modules: 4 bars plus 4 bars: 3 motivic attacks + 3 motivic attacks. Part II is a single climatic gesture which moves forward in pairs of measures - 2+2+4(2+2). In addition Part II incluces an increase in activity, not only on the local level (more notes per unit beat), but also in terms of the rate of events in the large melodic line:

EXAMPLE 35

In Part I, each phase embellishes but one fundamental pitch: In the first phase it is E and the second F. In Part II, E moves through F to G in 4 bars, G is prolonged for 2 bars and then moves back to C in the final 2 bars. Not only is the rate of events faster, but more important, the pitch distance covered is expanded, made larger--more happens. Thus the high level structural rhythm (8+8), the assymetrical but proportional inner grouping (4+4; 8) provide a framework, which "contains" the increasing rate of events generated by the skeletal melodic line.

Looking back, now, at Jorge's work, the evolution of his tune becomes clearer.

EXAMPLE 36

1. Through pairing and repetition he arrived at an initial tune-in-progress. Like a sketch of the completed tune, it includes the ascending sequential relation between its two parts and also the ending combination. But there

is little sense of development and no climax is achieved.

2. The next phase found Jorge: (Requests 51-57)

   a) Limiting his vista.

   b) Moving in and sharpening his focus on detail.

   c) Defining current problems (especially, what could follow G2).

   d) Defining the features of a possible solution.

3. The break-through occurs: (Requests 58-81)

   a) Jorge's initial assumptions about not pairing G2 and G4 are cast out when he juxtaposes them and recognizes his solution.

   b) Building outward, he elaborates this pair through repetition on one side and the ender, G3, on the other (G2G2G4G3) and thus finds the crucial climax and close.

   c) In a continuing search for a "middle" that would meet the constraints of 12 blocks in all, he tries G5G3G1G3--a skeleton of request # 49 and also of the first modules in the completed tune (Req. 75). Fleshing out the skeleton by repetition he arrives at G5G5G3; G1G1G3.

   d) Operating again, now, with a larger vista he freely pushes around modules, returns to the above arrangement to which he adds his newly discovered climax and his ending.

   e) With this whole tune "in hand", his final modification leads him to composition. Like Mark, he dips down once more to the level of precise pitch (singing rather than naming, though) to complete a tune that he likes.

The contrast between Mark's work and Jorge's work is striking. I will consider the contrast under three headings:

I. Strategies and Modes of Representation.

Mark's work was cautious, methodical; his intention was often explicit. Mark had a ready access to local features from the outset. His representation of local features served as a guide to more global relations into which the initially local features could be embedded. With a few trial combinations of blocks his representation of the "same" features was thus transformed. For example, in juxtaposing G4G2 Mark noted "a change in time" which on a more global level then became "O.K." Later, influenced by the pair, G2G1, he reversed his opening pair making it G2G4. G2 thus assumed a structurally more appropriate function leading in to G4rather than extending it on as before.

Mark's first significant decisions generated the functions, beginning and ending. With the limits of his tune defined, the framework for his work and for his tune was also defined. He had generated a context within which he could make choices, one in which particular features could assume particular functions. His process for completing the tune was to search for a series of events which would appropriately fill the gap between his defined limits. He paired the last block of his beginning pair with a possible next block. Continuing in this way, he built up a chain of blocks to which he could reasonably attach his ending combination. The gap filled, the tune was complete.

In contrast to Mark, Jorge worked impulsively, exploring many possibilities and responding often to the qualitative character of the results he generated. Jorge seemed more interested in the process itself. What would a new combination bring forth; how could he make use of his repeated pairs and expanding modules?

Jorge did not focus on local features of the blocks until well along in his work. (Unlike Mark, who could work "in his head", Jorge had to wait for the music box to "tell" him.) Starting with an initially broad vista, he worked down into details and then back up again to a larger vista which gradually changed as it included more and more explicit detail. In contrast to Mark's early definition of limits and subsequent directed chain building, Jorge worked outward (backwards and forwards) or just around wherever he happened to find himself. In addition he worked with trial whole tunes and then modified his trials to make a new whole.

The possible structure of the tune emerged slowly in this process of moving in and out of the material. Exploring, testing, building up and taking down, Jorge "accumulated" various features into his representation as he went along. In the process, the "meaning" of a block--i.e., its possible function in the whole-- was often transformed. Each new representation created a new set of possible constraints a new definition of problems. The most dramatic of these

moments occurred when he was able to define the features of a solution to his gnawing problem. The problem defined, he recognized a solution which in turn shattered his previous assumptions. The initially rejected pair, G2G4, which Jorge originally described as a "wild one" was rediscovered as the solution to his problem. With this break-through, Jorge's pre-built modules quickly fell into place. His internal representation of the blocks was again restructured; he could now find appropriate relations among them and thus complete his tune.

While Mark worked more quickly, he did so at the cost of defining a single structure early on, thus limiting possibilities, playing less, and maybe learning less too. Jorge's work was perhaps more like that of a real composer--immersing himself in the material and in his direct experience, he gradually discovered its potential for structural coherence.

II Results

Mark's tune is essentially a single, balanced antecedant-consequent statement: Phrase 1 starts at the high point, establishes implications for resolution but remains open-ended, incomplete, a structural up-beat to phrase 2. Phrase 2 realizes the harmonic and linear implications set up by phrase 1, closes them out, and balances phrase 1 rhythmically with a "surprise".

Jorge's tune is cumulative. 1) Statement of a generative motive, 2) development of this motive through ascending sequential elaboration, 3) a final longer gesture which leads to a climax. Climax is generated by an increase in the rate of events and an ascent to the high point of the piece, followed by quick resolution and closure.

Do the results reflect the strategies invoked? The two completed tunes are certainly different in their structure and in their effect. It is tempting to make a correlation between Jorge's more impulsive, even flamboyant style and his tune with its dramatic build-up, its cumulative structure. In turn we can observe a relation between Mark's careful and methodical strategy and his neatly balanced, relatively straightforward and constrained musical statements. But how much are these results influenced by strategy? What about other factors like tacit models of a sensible tune together with differences in ethnic and

intellectual backgrounds and in the traditions implicit in these backgrounds? The relation between strategy and results must remain for the moment an open question, but one which suggests the need for further research with more and different kinds of players. It is clear, for example, that tacit models did influence each player's decision making, his notion of what constitutes appropriate relations, or "logical" structure.

III Tacit Models

What are the differences in the model-for-a-sensible-tune which is guiding each player's decisions? The last stages of Mark's work brought out certain structural features of his model--particularly the importance of higher level rhythmic symmetry. With Jorge it was much more dramatic!

When Jorge had completed his tune, he listened to the tune from which the blocks had originally been taken--a French folk song:

EXAMPLE 38

Looking quite astonished, he whistled and said, "That's totally different! I never would have arrived at that." And on second hearing, " It's unbelievable that G4 begins the tune. I never heard a tune like that!" The context was so different he didn't even notice that both tunes end identically!

Curious now to hear the tunes that Jorge <u>did</u> know--the body of music from which his model must derive, he was asked to sing some Peruvian songs. More extended and elaborate than Jorge's tune, their structure proved remarkably similar! Characteristically they were cumulative: They included repetition of small, melodic cells, each one clearly articulated. These cells were, in turn, developed sequentially leading to a longer gesture which reached a climax and

then quickly and abruptly came to a close. Rarely did the Peruvian songs include the characteristic balanced antecedant-consequent phrase structure so typical of familiar nursery-rhyme tunes, of the French song, and, indeed, Mark's tune. At first they sounded as strange to me as the French song did to Jorge. I said, for example, when he finished the first song, "Is that the end?" Jorge replied, "You really have to know the words to get it."

In fact, Mark's tune is, in basic structure, quite similar to the first part of French: A single, two-phrase "sentence". The first phrase, an antecedant, starting with a "lead-in" to the high point, reaching towards resolution but remaining open-ended; the second phrase, a consequent, starting much like the first but reaching resolution and closure. Mark was by contrast perfectly satisfied with the original tune--it was another, perhaps more successful, realization of his model. He commented, merely, "Oh, yah."

Indeed, why is the original folk song more successful? Several features seem pertiment:

1. The implications of the initial motivic materials are further "worked out"; the tune is more complete--it includes a beginning, an elaboration of the opening material (middle) together with a return--A/B+A1/.

2. Motives appear embedded in new contexts exploiting their implications, thus providing both variation and unity. For example, G1 appears in three different contexts, each time with a different function. Indeed, G1 acts as a kind of pivot, each time sending the tune off in a new direction: In A: Hint of closure which is fulfilled only as it returns to G4 followed this time by G3. In B: Sequential elaboration, G1G5 and finally preparation for return, G1G2. Indeed, the pair G1G2, appears twice, but the context disguises this paired repetition.

3. All of the phrases are balanced as are the two large sections of the melody-i.e., A and B+A^1. However, the second half of the tune generates two distinct structural functions, development and return. Thus, the second half, while equal in total duration, includes a greater density of structural events.

4. Finally, the return of the pair G4G3 seems both fresh and familiar as a result of the elaboration and development which precedes it.

Interestingly, experienced musicians who have played with this set of blocks frequently build a tune much like the original, but often exclude the first and last statements of G1, saving both G1 and G5 for the elaboration in B.

While Jorge's tune clearly derives from a different model, it does share with the original tune, development of material and a sense of directed motion through the build up of tension and its release. On the other hand, differences in the function, the "meaning", of the various blocks in Jorge's tune as compared with the original are striking. Meaning in music is indeed context dependent!

SOME SPECULATIVE CONCLUSIONS.

It should be clear, now that both Jorge and Mark, were involved each in his own way in active analysis of musical relations. The relations were perhaps "primitive", but they were so in two senses: The materials with which they worked were limited and in this sense primitive; but the decisions they made, problems they faced demanded a confrontation with the powerful primitives from which much larger and more complex musical structure derives. Observation of the students' procedures, comments and decisions also thrust us into an analysis and re-examination of certain fundamentals of musical coherence and of learning.

I. The categories implicit in music notation and music theory as modes of representation tend to guide their users towards the selection of certain features and to the exclusion of others. Our students had to discover their own priorities, their own processes of selection. Since our students did not read music notation, they were not influenced by the particular selection of features captured by this mode of representation. Nor were they influenced by the categories implicit in traditional music theory.

As a result, those descriptions which we, as trained musicians had come to take for granted, were often burst open for re-examination. We discovered for example, that features selected by the categories of traditional music theory are not givens-they must be generated by relations among a collection of features. Tonic or key center, for instance, results from an aggregate of features; even beat and certainly beat groups or meter results from a collection

of features. For the students these were not givens, assumptions implicit in the notation, but rather relations which were generated by the "data" as the students gradually enriched their representation of that data.

II. Musical perception, like visual perception, is a process of intelligent reconstruction. While the computer-driven music box always outputs the same "data", the human perceiver processes this information in various ways depending on which features he gives priority to or even has access to--i.e., just how he represents the "data" to himself. Focus is influenced by the particular context in which a particular figure is embedded--actually, or in the player's imagination. A new context suggests new priorities and reveals new features. Learning occurs when the student gains greater freedom in his ability to enrich his representation as he discovers ever new relations among these features. For example, players tended to focus first on a particular characteristic of a single block or perhaps on some feature which two blocks shared or by which one block might be distinguished from another. Later, new features became accessible often as the result of new contextual embeddings, often generating a higher level representation. In addition, as students gained a glimpse of a whole tune, more global features emerged--features that had to do with relations among ALL the blocks. The most significant learning occured in the dynamic interplay between local and more global focus; local detail shed light on global possibilities, global structure revealed new details. Indeed, the whole process reflects the interplay between detail and larger design which is such a powerful

factor in the vastly more complex world of, for example, a movement of a Haydn Quartet. Here, shifts in focus, new contextual embeddings, transformation and elaboration of a single detail or a brief motive are essential components in the logic and affect of the work, itself. Without access to such processes within the work of a great composer, its very greatness often remains beyond the experience of the listener.

In fact, the learning which took place for Mark and Jorge bears certain similarities to the learning which occurs in the work of the creative musician--composer or performer. Arnold Schoenberg says, in his book, Fundamentals of Musical Composition:[4]

> ".....one can comprehend only what one can keep in mind. Man's mental limitations prevent him from grasping anything which is too extended. Thus, appropriate subdivision facilitates understanding and determines form. A composer does not, of course, add bit by bit, as a child does in building with wooden blocks. He conceives an entire composition as a spontaneous vision. Then he proceeds, like Michelangelo who chiselled his Moses out of the marble without sketches, complete in every detail, thus directly forming his material. No beginner is capable of envisaging a composition in its entirety; hence he must proceed gradually, from the simpler to the more complex. Simplified practice forms, which do not always correspond to art forms, help a student to acquire the sense of form and a knowledge of the essentials of construction. It will be useful to start by building musical blocks and connecting them intelligently...These musical blocks (phrases, motives, etc.) will provide the material for building larger units of various kinds, according to the requirements of the structure. Thus the demands of logic, coherence and comprehensibility can be fulfilled, in relation to the need for contrast, variety and fluency of presentation."

Schoenberg's design for the development of young composers seems close to the process we have observed in the work of our two players. But what about the role of tacit models for our students and for composers? It seems clear that such models functioned as constraints in our students decisions, in their sense of "logic" and appropriateness. But for Mark and Jorge the process of discovering implications in the given material necessarily remained within the constraints of that material and also within the constraints of their tacit models. Mark introduced the term, "match", "I don't know how to match". And both students at a dynamic moment in their work looked for the explicit constraints of a right answer, "How long is this tune". But still the solution only emerged after each player had sufficiently (for himself) explored the implications of the material. Only then could they make a particular product which reasonably matched their model.

For serious composers such models play a significant role, too, but in a more dynamic way. E.H. Gombrich uses the term, stylistic schemata, in discussing the role of models in the creative process. He speaks of "matching and making"...The composer approaches the creation of a new work through the "mediation of an internalized vocabulary of forms and schemata....Invention is both a process of coding by means of such a vocabulary ("matching") and a process of modification ("making") toward some goal-image for the product" [5]

Studying Beethoven's sketch books we see a clear instance of this process in his relentless modifications of motives--particularly beginnings. An initial, often banal idea, (banal exactly because of its close "match" with stylistic norms or stylistic schemata) undergoes endless modifications. The normative constraints of the initial idea are restructured in the light of implications which Beethoven foresees--the potential of the motive to assume new functions and new character within his "goal-image". Transformations occur as Beethoven, in his head, embeds the motive in new contexts; simultaneously he seems to envisage the structure as a whole--a structure which is, itself, still evolving. Thus Beethoven's modifications of a single motive represent much more than explicit local changes. The process of transformation helps to define the unique constraints through which the particular whole evolves. Beethoven's workbooks suggest a more subtle meaning for Schoenberg's statement that a composer "conceives an entire composition as a spontaneous vision".

Thus, we might say that the serious composer compared with our players is more concerned with "making" than he is with "matching". His product reflects a dynamic interaction between the constraints of traditional models and the evolving constraints generated by the compositional process, itself. Indeed, a new work may be on the fringe of comprehensibility for those listeners who are searching for good "matches". Claude Levi-Strauss says, in discussing 20th century serial music:[6]

> Either it will succeed in bridging the traditional gap between listener and composer and--by depriving the former of the possibility of referring unconciously to a general system--will at the same time oblige him, if he is to understand the music he hears, to reproduce the individual act of creation on his own account. Through the power of an ever new, internal logic, each work will rouse the listener from his state of passivity and make him share in its impulse, so that there will no longer be a difference of kind, but only of degree, between inventing music and listening to it.

This may be an equally appropriate description of the truly musical listener even when the composition <u>does</u> allow the listener to refer "unconsciously to a general system"--for example, with works of Beethoven or Haydn. Too often, though, the listener lets such works slip by, by giving in solely to its familiar "stylistic schemata". Failing then to be roused from this "state of passivity", he will also fail to discover the "ever new internal logic", the <u>unique process</u> which distinguishes the great work--that which makes it more than just another instance of a style. It is precisely meeting these musical demands on the listener which we see as one of the primary goals of our students' work.

And if we consider the <u>performer's</u> process of learning a work, the comparison with our students' learning is even more exact. The performer with a set of givens, an existing, complete work, must also become involved in a continuous process of re-hearing, of re-structuring, of discovering the particular coherence in the work he studies. Concretely this often involves a shift from local considerations (playing each note on the page with the right pitch and rhythm, overcoming technical difficulties, etc.) to global considerations--like relations of harmonic direction, structural downbeats, grouping and articulation of motives and phases, and the proportions of parts to a whole. As with Mark and Jorge, the "same" features assume new

meanings--fast becomes slow, upbeat becomes downbeat. But in the end, of course, global considerations must dictate local decision; indeed, this may be one way of describing a "musical performance".

Artur Schnabel is said to have described such performance this way:[7]

> In high tension--emotional and intellectual--the performer must anticipate the rendering in sound of the entire composition, as a total unit. Schanbel compared this with the intake of a deep breath--deep enough to make the entire performance appear as one slow exhalation.... Any pre-occupation, at the moment of performance (and this is what differentiates performing from certain preliminary phases of practicing), with playing the right notes, memory, fingerings, or with thoughts on the 'difficulty' of a section of a piece makes it impossible to concentrate fully in the way here described.

Of course this development from local to global "hearing" is not a simple one-way path. As with Jorge movement from the larger vista to focus on some detail may carry with it implications which again affect the larger conception. Again Schnabel's view was:[8]

> The mature performer works for those rare inspirations when his conception of a score becomes one with its physical realization in performance. At such moments technique is more than just the disciplined functioning of the body at the command of the ear: it grows into a physical activity which in turn may stimulate the imagination...Piano technique, as Schnabel used the term and taught it, is the faculty to establish channels between the sound heard inwardly and its realization in all individualized subtlety...His method of practicing was experiment rather than drill.

The comparison of our students' work with that of great musicians may seem far-flung. But one should not confuse the product with the process. We have been concerned, here, with a way of learning which hopefully both reveals and shares in the kind of learning--by experiment rather than drill--which seems so characteristic of creative activity. For it is through building up, taking down, combining and re-combining, embedding detail in larger design, thus restructuring one's internal representations, that new implications are born, new knowledge discovered. Most specifically, it is by discovering and playing with the constraints of what does make sense or of what one can do, that the learner cracks the boundaries of his perception; he develops the capacity to "appreciate", even to invent new constraints. Perhaps it is in just this interplay between constraints and invention between the known, the unknown and knowing that learning takes its biggest leaps.

FOOTNOTES

1 See Bamberger, Jeanne, "Learning to Think Musically", Music Educator's Journal, March, 1973 and Bamberger, Jeanne, "The Luxury of Necessity", Bulletin, National Association of Schools of Music, 1974

2 See Bamberger, Jeanne, "Progress Report", LOGO Memo # 13

3 For the complete protocol of Mark and Jorge see Appendix.

4 Schoenberg, Arnold, Fundamentals of Musical Composition, St. Martins Press, Inc., New York, 1967, p. 1-2.

5 Gombrich, E.H., "Art and Illusion", Princeton University Press, 1960 pp 88-90.

6 Levi-Strauss, The Raw and the Cooked, Harper and Row, New York, 1969, p.26.

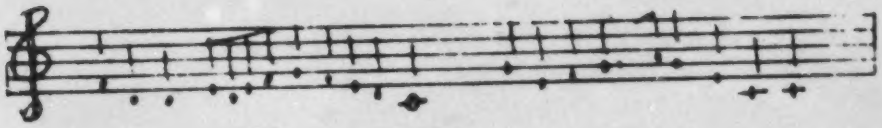
7 Wolff, Konrad, The Teaching of Artur Schnabel, Praeger Publishers, New York, 1972, p. 20.

8 Wolff, K. ibid., p. 22; p. 173

A P P E N D I X

J O R G E - PROTOCOL

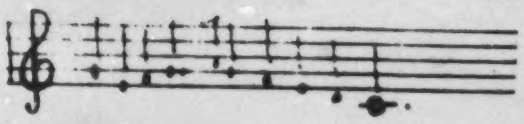
1. g1 g2 g3 g4 g5



2. g1g1
3. g3
4. g2
5. g4
6. g2
7. g5
8. g1
9. g2
10. g3
11. g4

"g2 and g4 are the main parts -- but how to use them?
I don't know what comes after g2."
"g5 may be an ending."

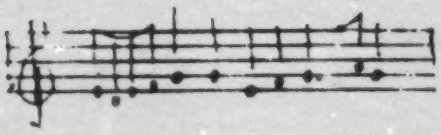
12. g1 g1 g2 g2 g3 g1 g4 g3 g5
13. g1 g5
14. g2 g1
15. g1 g3
16. g2 g5
17. g1 g1 g2 g1 g3
18. g5 g2
19. g4
20. g2 g3
21. g4
22. g4 g5
23. g3

24. g4 g3

...."Good, and maybe at the end after g2."

25. g2 g3

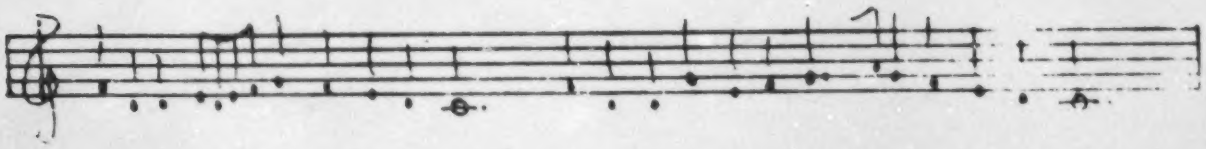
..."Not too good, not too bad."

26. g1 g1 g2 g2 g3

27. g2 g4

..."It's a wild one, huh?"

28. g2 g3
29. g2 g2
30. g5 g4

31. g1 g2 g3 g1 g4 g3



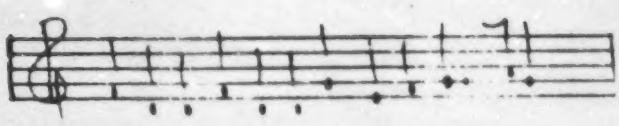
...agreed that he was thinking of this grouping: [g1 g2] g3, [g1 g4] g3,

32. g2 g4

33. g4 g5

34. g5 g5 g2

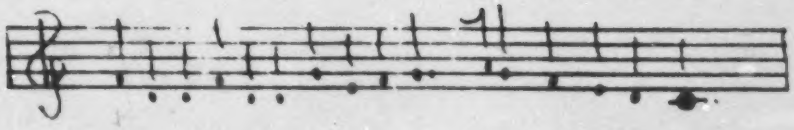
35. g1 g1 g4



36. g3 g4
37. g5 g2
38. g3
39. g3 g5
40. g1 g1 g2 g5 g5 g4 g3

41. g5 g5 g2 g2

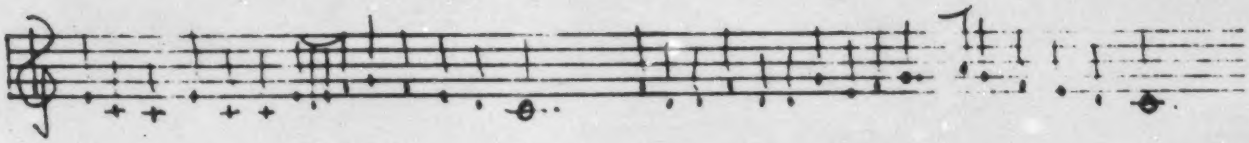
42. g1 g1 g4 g3



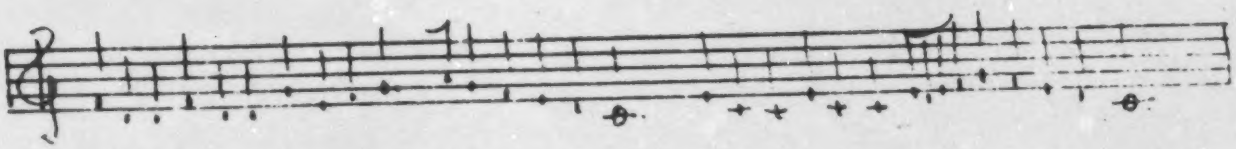
43. g4 g2
44. g2 g3
45. g1 g2
46. g5 g5 g2
47. g1 g1 g4

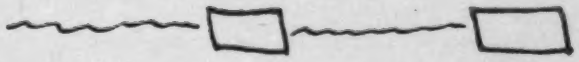
48. g5 g5 g2 g1 g1 g4 g3

49. g5 g5 g2 g3 g1 g1 g4 g3



50. g5 g5 g2 g3 g1 g1 g4 g3 ....beginning next session where he left off.

51. g1 g1 g4 g3 g5 g5 g2 g3

52. g2 g3 ..."g3 has a silence at the end so it must be a link, and at the end."



THE OBSERVER: "a silence?"

53. g3 g1 ..."No - a long note; so I think it must be an ending."

54. g5 g5 g2 g3 g1 g1 g4 g3

55. g2 g4 ...he notates.....

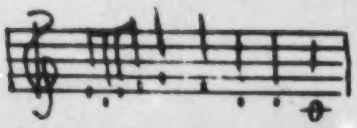
"Before, I couldn't remember them so well, now I can spend less time playing them."

OBSERVER: "What do you know so far?"

..."g2 and g4 are complex, important."

..."g3 is an ending. It goes perfectly with g4."

OBSERVER: "Does it go after g2?"

56. g2 g3

..."I didn't like it. The problem with g2 is it ends too fas it goes up and should have something else before going down. The last note of g2 is too quick, it ends right on the border of the next one, so the next one needs more time in beginning."

"Maybe g1 after g2."

57. g5 g5 g2 g2 g1 g1 g4 g3

..."No, no space; but is better."

58. g2 g1

59. g5 g2

60. g1 g3

61. g2 g5

62. g1 g1 g3

..."How long is this tune?"

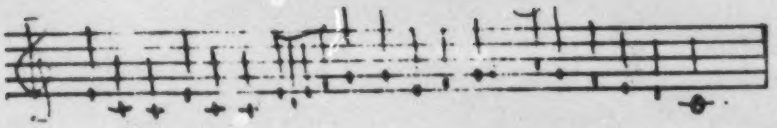
OBSERVER: "12 blocks."

..."Yes, I thought I was missing something in the middle."

63. g5 g5 g2 g2 g1 g1 g3

64. g2 g3

65. g5 g5 g2 g4 g3



..."This will be a strange one."

OBSERVER: "Why?"

..."Because I never thought of mixing g2 and g4. I felt they were separate groups. I thought the complex ones would be surrounded by simple ones (like islands), but they sound not bad."

66. g1 g2

67. g1 g2

68. g2 g4

69. g2 g2 g4 g3

OBSERVER read Jorge's previous description of g2.

"Yes, g4 doesn't go down immediately, and its slower."

70. g5 g5 g1 g1

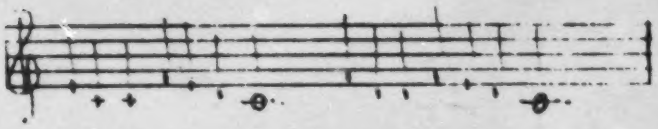
71. g3 g3

72. g5 g5 g2 g2 g1 g1 g3 g3 g2 g2 g4 g3

73. g2 g2 g3 g3

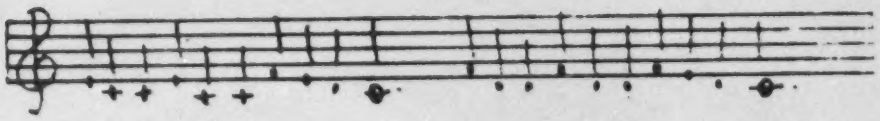
74. g1 g1 g2 g2 g4 g3

75. g5 g3 g1 g3



76. g2 64

77. g5 g5 g3 g1 g1 g3

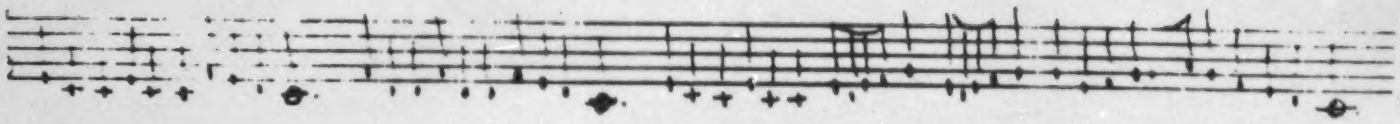


.."You shouldn't have told me that there were 12 blocks."

OBSERVER: "Just get your own tune logical, O.K?"

78. g5 g5 g4

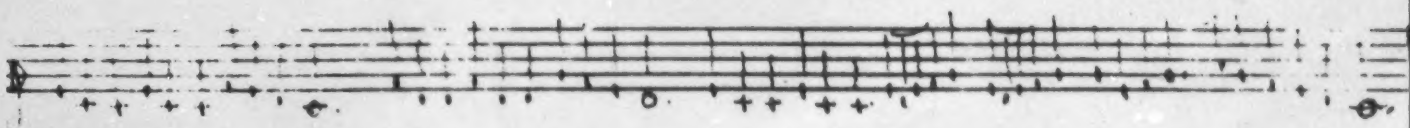
79. g1 g1 g3 g5 g5 g3 g5 g5 g2 g2 g4 g3

80. g5 g5 g3 g1 g1 g3 g5 g5 g2 g2 g4 g3

..."That's all right."

81. g5 g5 g3 g1 g1 g3

..."I would like to have a g6 in the place of the second g3" (Sang g.f.e.d...checked at the piano...) "Yes."

82.



FRENCH:

(Whistles.."wow")..."That's totally different! I never would have arrived at it!"

FRENCH....."It's unbelievable that g4 begins the tune."

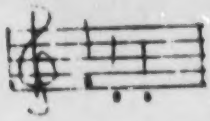
M A R K - PROTOCOL

MARK

REQUESTS

COMMENTS

1. g1

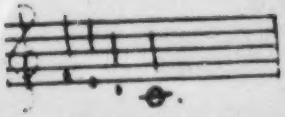


.....-"ah - oh"

2. g2

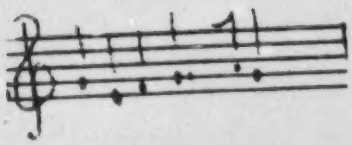
....."the fast one"

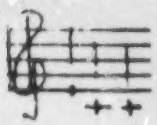
3. g3



....."could be a closing"

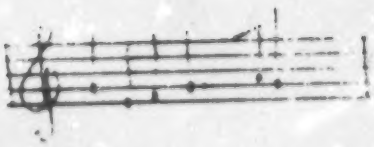
4. g4



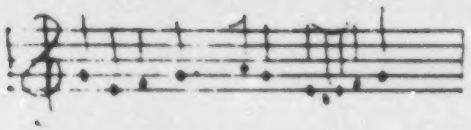
5. g5 ......"similar to g1"

6. g1 g5

7. g3 ....."can be related to g1 g5 or to g4"

8. g4 ....."there has to be a flow between two blocks, the change can't be too great"



9. g4 g2

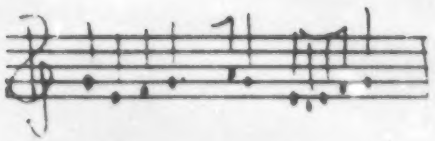


....."sounds like an opening, but there's a change in time."
(pause)
"How long is this tune?"
(pause)
"I don't know how to match."

10. g1 g3 g5

....."Ah, cool - I could end the song with g3 - a long note, but g5 would be a surprise ending."

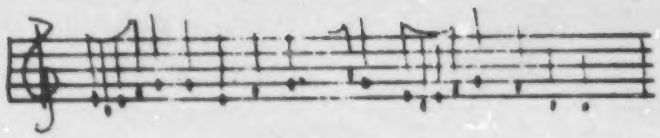
11. g4 g2



....."A change in time, but still O.K."

12. g2 g1

13. g2 g4 g2 g1

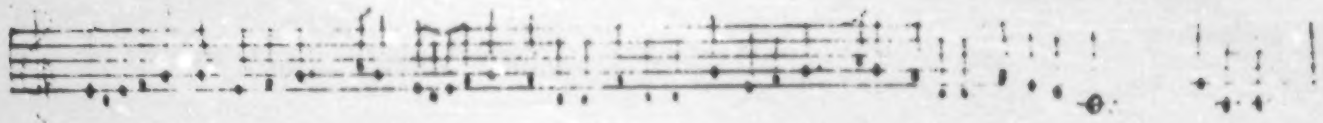


14. g2 g5

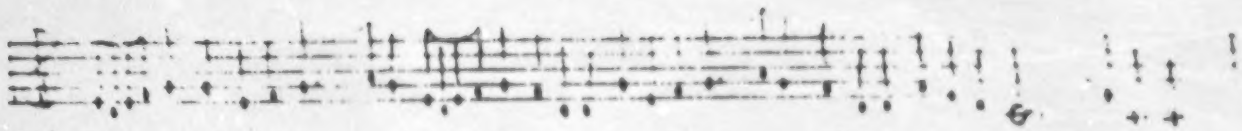
15. g1 64

16. g1 g4 g1 g3 g5

17. TO MARK: g2 g4 g2 g1 g1 g4 g1 g3 g5

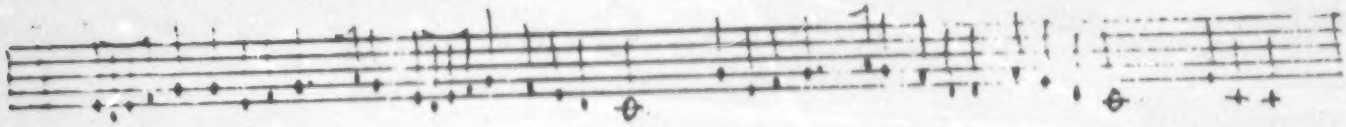


18. TO MARK1:

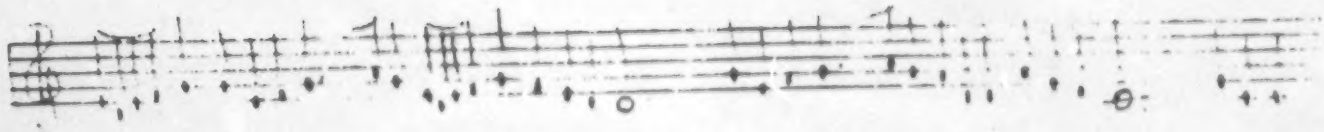


"Deleting one of the g1's.....much better."

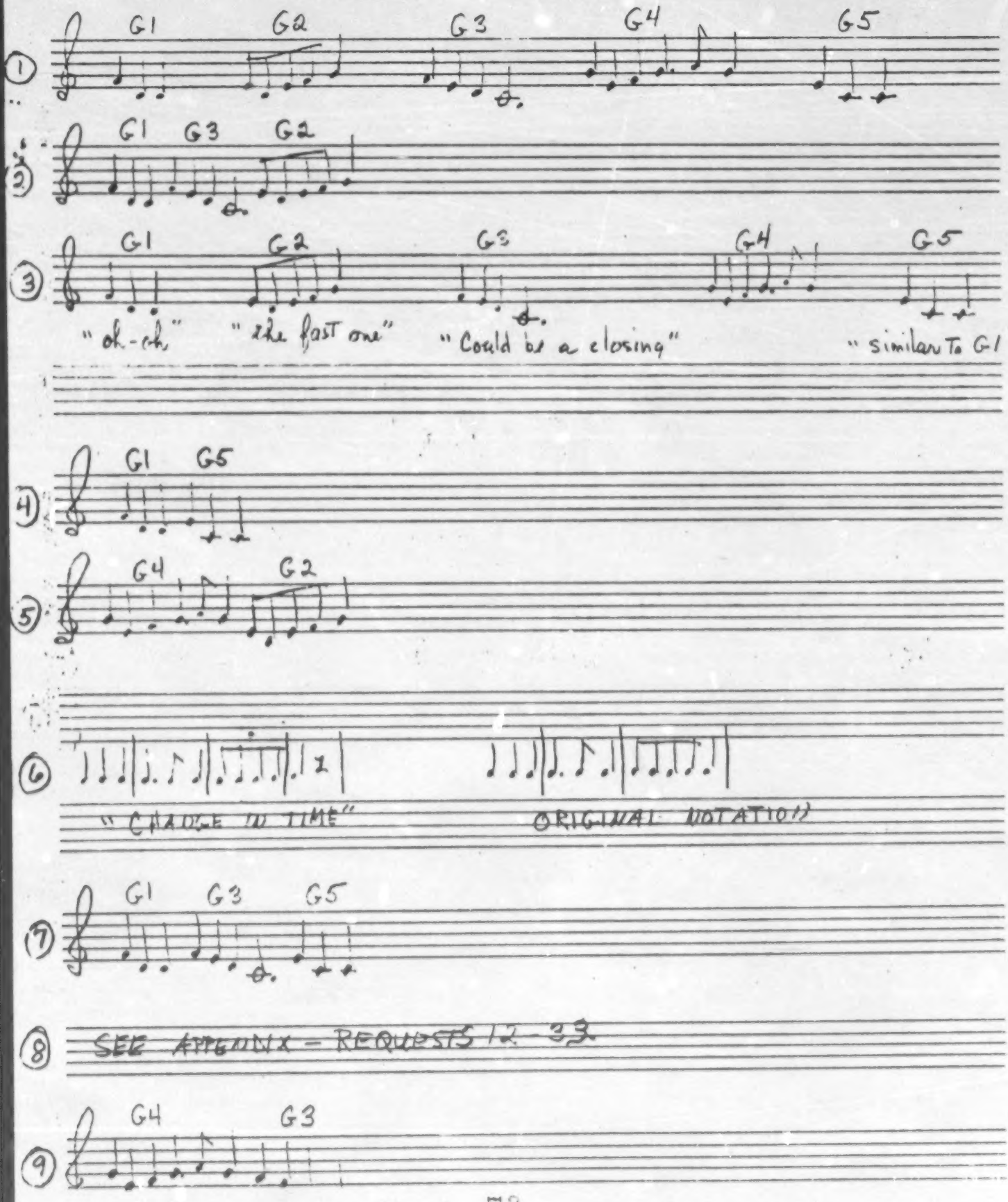
19. TO MARK2

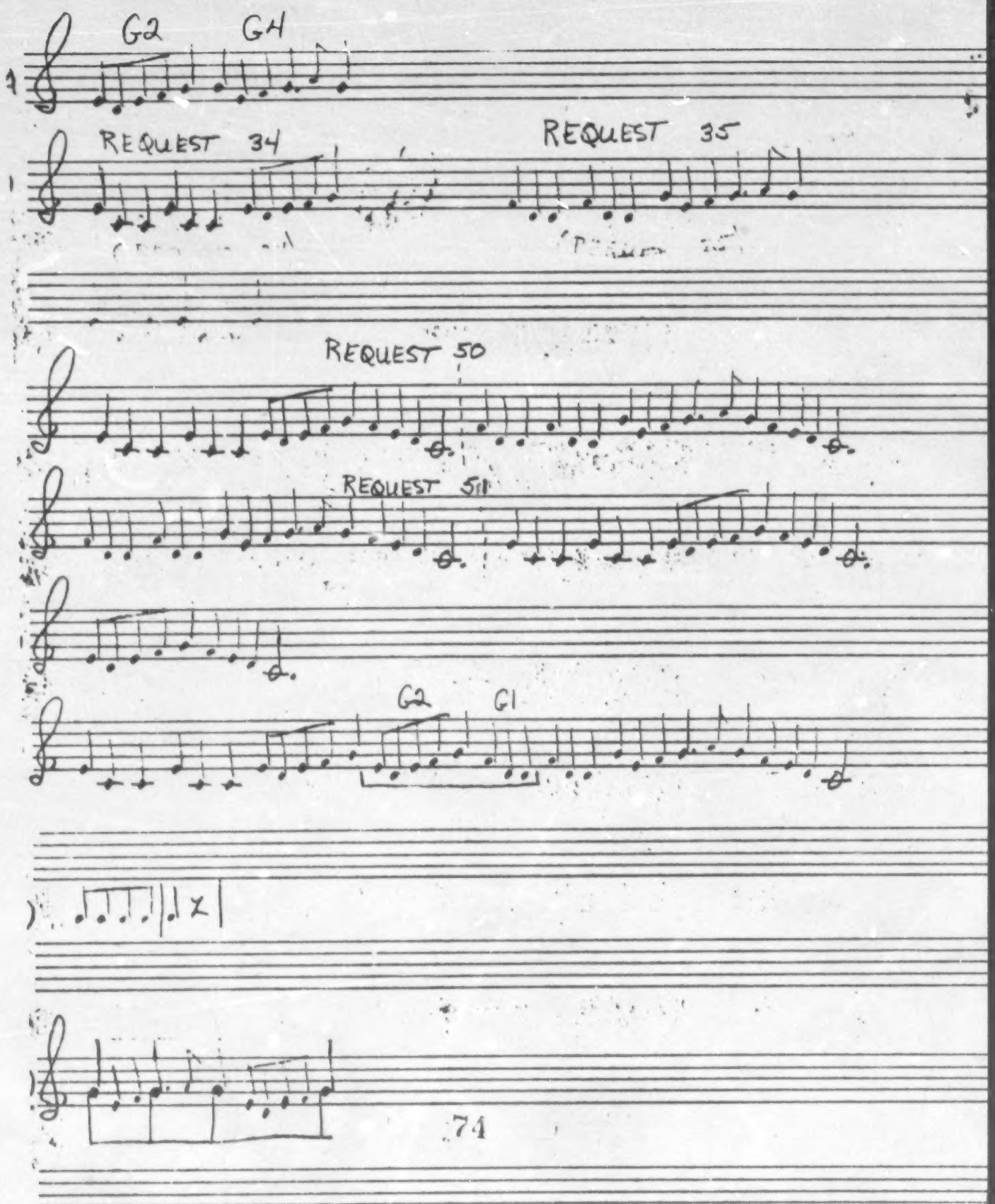
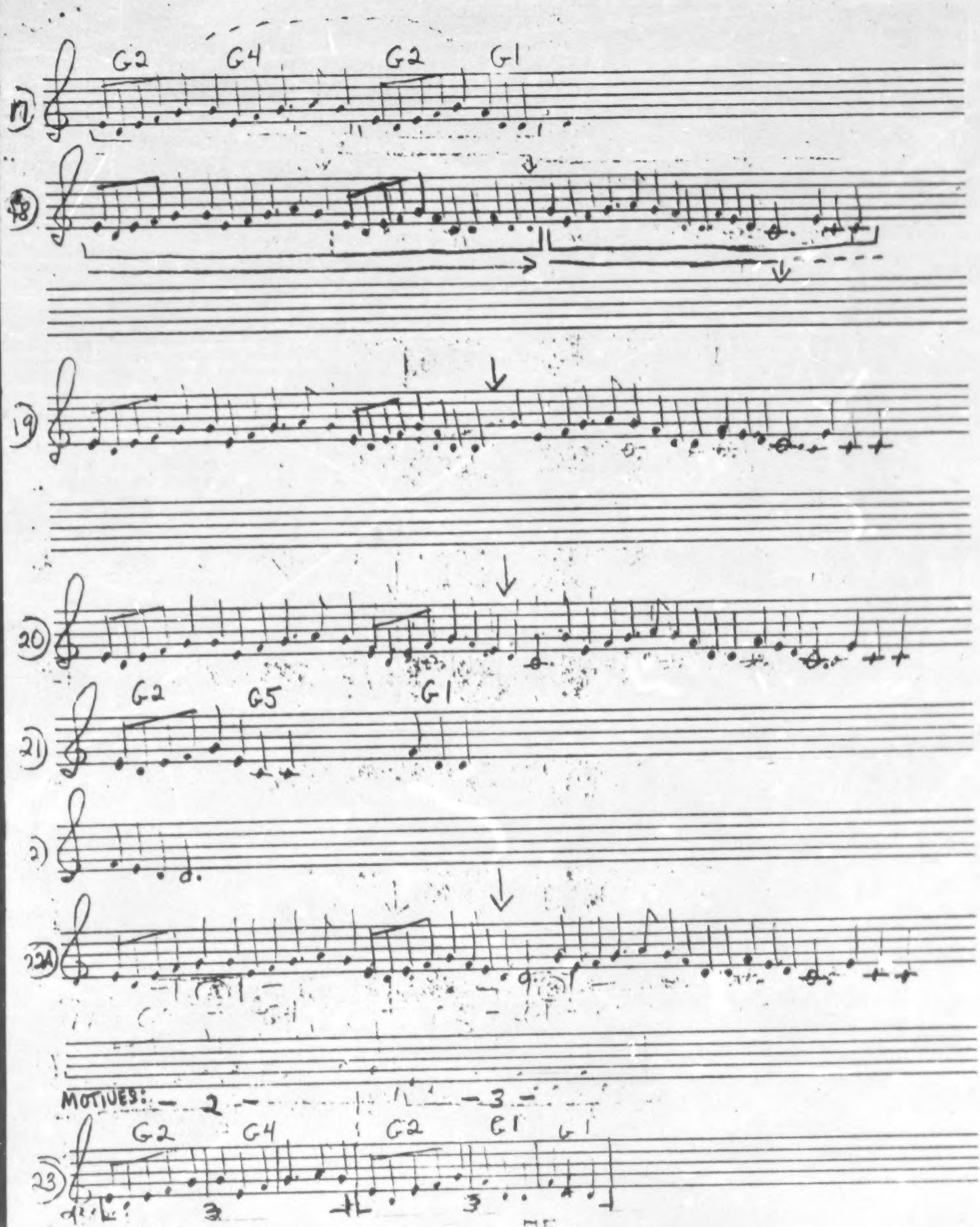
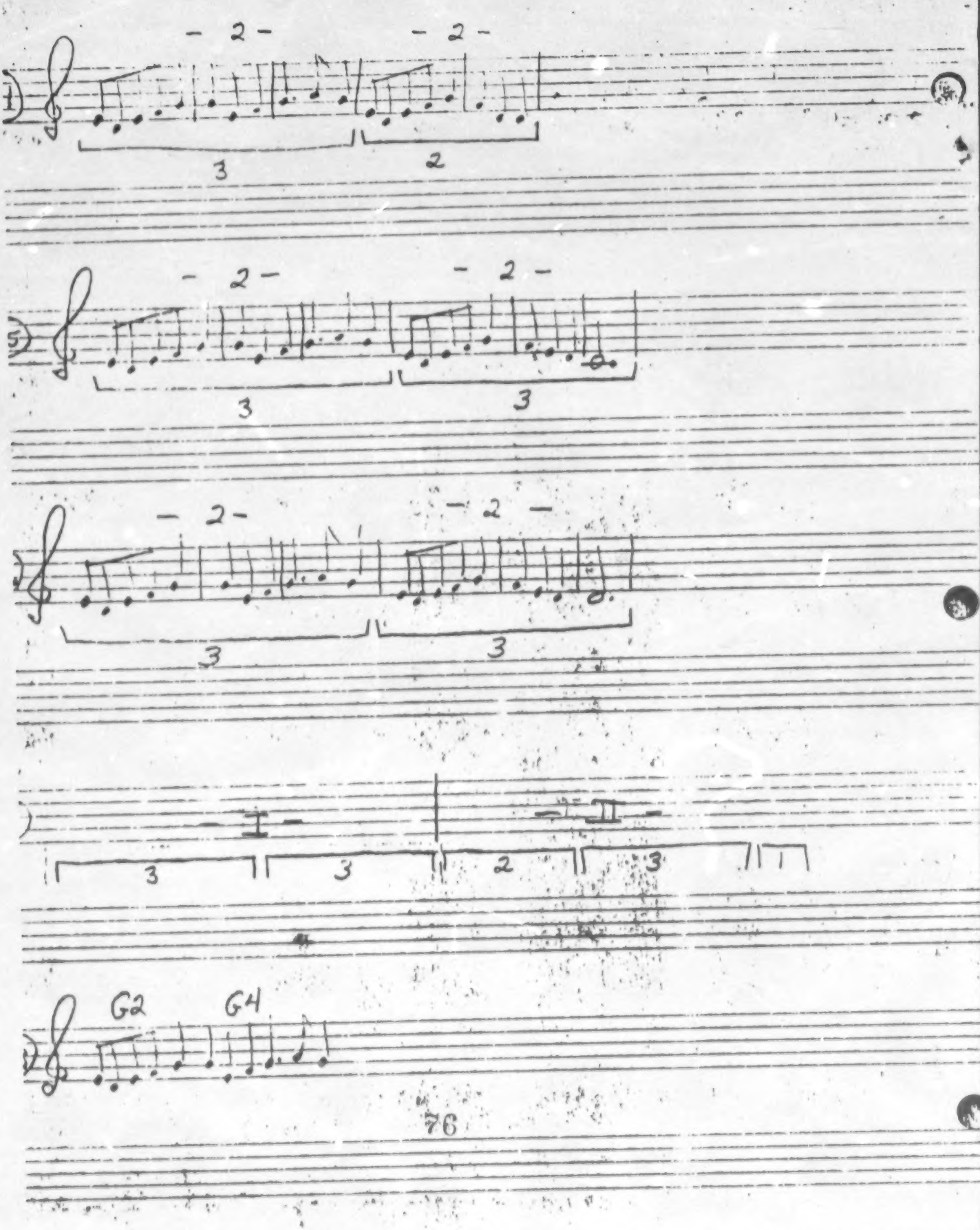


"That wasn't right...g3 wasn't the right note; too low."
"Wanted it to end of the same note as g1."



EXAMPLES


1
G1
G2
G3
G4
G5
2
G1
G3
G2
3
G1
G2
G3
G4
G5
"ah-ah"
"the first one"
"Could be a closing"
"similar to G1
4
G1
G5
5
G4
G2
6
"CHANGE IN TIME"
ORIGINAL NOTATION
7
G1
G3
G5
8
SEE APPENDIX - REQUESTS 12 33.
9
G4
G3


G2
G4
REQUEST 34
REQUEST 35
REQUEST 50
REQUEST 51
G2
G1

17
G2
G4
G2
G1
18
19
20
21
G2
G5
G1
22
MOTIVES: 2 3
23
G2
G4
G2
G1
G1

- 2 -
- 2 -
3
2
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3
3
- 2 -
- 2 -
3
3
I
II
3
3
2
3
G2
G4

REQUEST 75

29

REQUEST 77

REQUEST 79

REVERSE

NEW BEGIN

ENDING

30

COMBINATION

31

opening

development

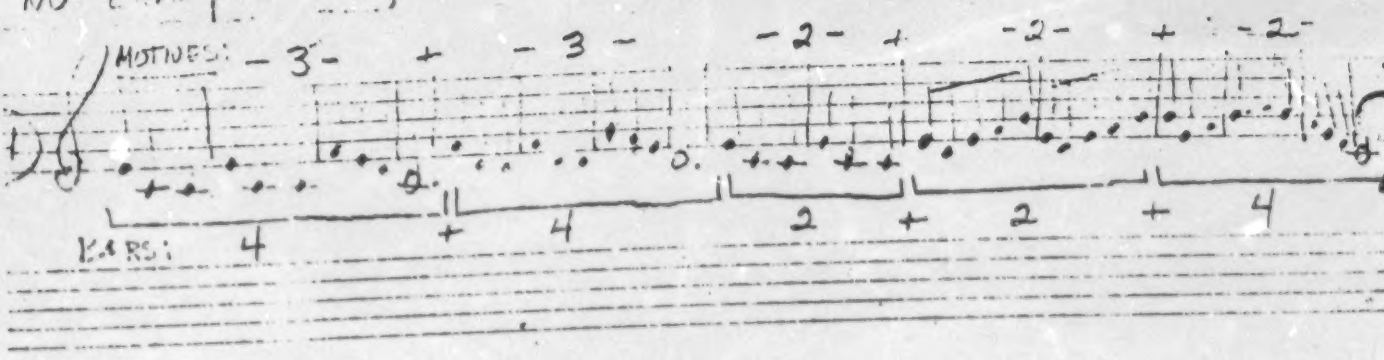
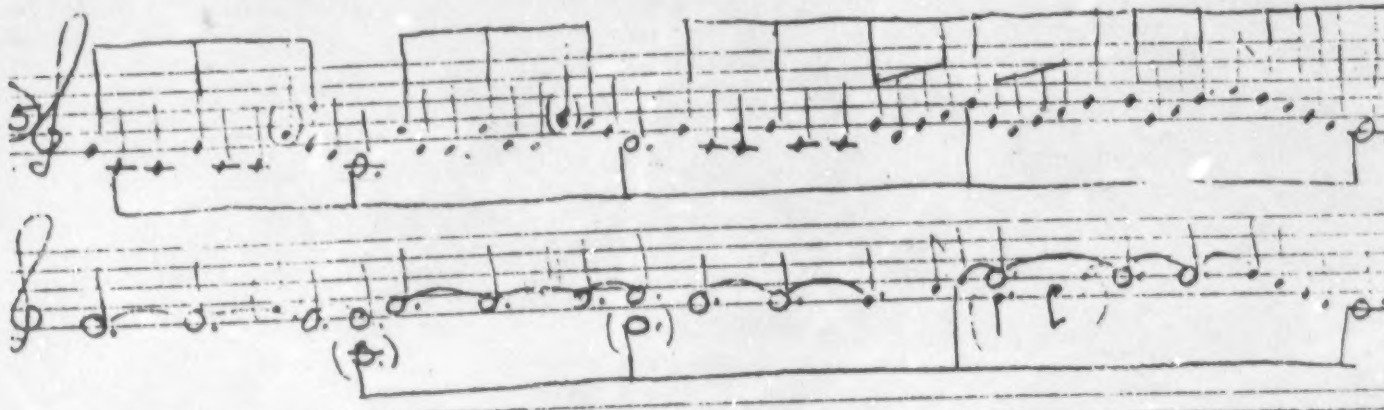
begin-again

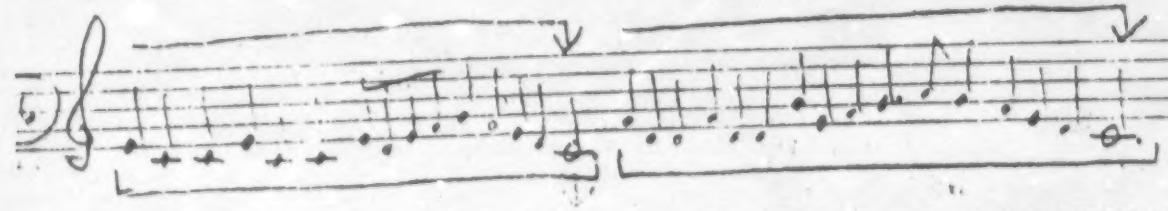
climax

end

32

Gb

NO EXAMPLE 33

REQUEST 49



37 - SEE EXAMPLE 29